

CLAIMS

1. An article holder comprising:
a first body surrounding a first vortex chamber and having gas inlet and outlet passages terminating at the first vortex chamber; and
5 a second body surrounding a second vortex chamber and having gas inlet and outlet passages terminating at the second vortex chamber;
wherein a combination of the first vortex chamber with all of the gas inlet and outlet passages terminating at the first vortex chamber is not geometrically identical to a
10 combination of the second vortex chamber with all of the gas inlet and outlet passages terminating at the second vortex chamber.
2. The article holder of Claim 1 wherein all of the one or more gas inlets terminating at the first vortex chamber have a larger combined cross-sectional area than all of the one or more gas inlets terminating at the second vortex chamber.
3. The article holder of Claim 2 in combination with an apparatus for rotating the
15 article holder around at least one axis, wherein a minimum distance between said axis and the first vortex chamber is smaller than a minimum distance between said axis and the second vortex chamber.
4. The article holder of Claim 1 wherein the first gas vortex chamber has more gas inlets than the second gas vortex chamber.
- 20 5. The article holder of Claim 4 in combination with an apparatus for rotating the article holder around at least one axis, wherein a minimum distance between said axis and the first vortex chamber is smaller than a minimum distance between said axis and the second vortex chamber.
6. The article holder of Claim 1 wherein the first vortex chamber has a tangential gas
25 inlet for creating a gas vortex and has a non-tangential gas inlet, and the second vortex chamber has a tangential gas inlet but does not have a non-tangential gas inlet.

7. The article holder of Claim 6 in combination with an apparatus for rotating the article holder around at least one axis, wherein a minimum distance between said axis and the first vortex chamber is smaller than a minimum distance between said axis and the second vortex chamber.

5 8. An article holder having a surface which is to face an article held in the holder, the article holder comprising a plurality of vortex chucks having outlets in said surface, wherein the surface has a first portion having one or more outlets therein and a second portion having one or more outlets therein, the first and second portions have equal areas, and the first portion has more outlets per unit area than the second portion.

10 9. The article holder of Claim 8 in combination with an apparatus for rotating the article holder around at least one axis, wherein a minimum distance between said axis and the first portion of said surface is smaller than a minimum distance between said axis and the second portion.

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15 10. An article holder having vortex chucks which are to emit gas vortices to hold an article, wherein all of the vortex chucks which are to emit vortices to hold an article have outlets in a surface which is to be face the article, wherein the surface consists of a first portion and a second portion, wherein the first portion has at least some of its area occupied by at least a part of a vortex chuck outlet, and the second portion also has at least some of its area occupied by at least a part of a vortex chuck outlet, wherein the first
20 portion has a larger percentage of its area occupied by the vortex chuck outlets than the second portion.

11. The article holder of Claim 10 in combination with an angle drive having an arm attached to the article holder and having an axis of rotation, wherein all of the first portion of said surface lies closer to said axis than all of the second portion.

25 12. The article holder of Claim 10 wherein the first and second portions have equal areas.

13. A method for holding an article, the method comprising:

emitting one or more first gas flows flowing from one or more first vortex chucks and impinging on a first portion of the article; and

emitting one or more second gas flows flowing from one or more second vortex chucks an impinging on a second portion of the article;

5 wherein the one or more first gas flows cool the first portion of the article by more degrees than the one or more second gas flows cool the second portion of the article.

14. The method of Claim 13 further comprising rotating the article around at least one axis, wherein a minimum distance between said axis and the one or more first vortex
10 chucks is smaller than a minimum distance between said axis and the one or more second vortex chucks.

15. The method of Claim 14 wherein the operation of rotating occurs simultaneously with emitting the first and second gas flows and simultaneously with the article being processed with plasma.

16. A method for holding an article, the method comprising:
15 emitting gas from a first vortex chamber to hold an article; and
 emitting gas from a second vortex chamber to hold the article;
 wherein the gas emitted from the first vortex chamber is colder than the gas emitted from the second vortex chamber.

17. The method of Claim 16 further comprising rotating the article around at least one
20 axis while emitting gas from the first and second vortex chambers, wherein a minimum distance between said axis and the first vortex chamber is smaller than a minimum distance between said axis and the second vortex chamber.

18. An apparatus comprising an article holder comprising one or more first vortex
25 chambers to be positioned opposite to a first portion of the article, and one or more second vortex chambers to be positioned opposite to a second portion of the article, wherein during operation a first portion of the article is cooled more by the one or more first vortex chambers than is a second portion of the article cooled by the one or more second vortex chambers.

19. The apparatus of Claim 18 further comprising at least one angle drive for rotating the article holder around an axis, wherein a minimum distance between the axis and the one or more first vortex chambers is smaller than a minimum distance between the axis and the one or more second vortex chambers.

5 20. The apparatus of Claim 18 further comprising at least one drive for moving the article while the article is held in the holder so that at least a portion of the article directly opposite to the one or more first vortex chambers moves faster than at least a portion of the article opposite to the one or more second vortex chambers.

10 21. An apparatus comprising an article holder comprising one or more first vortex chucks and one or more second vortex chucks, the first and second vortex chucks being to emit gas vortices to hold an article, wherein during operation the one or more first vortex chucks emits more gas per unit of time than the one or more second vortex chucks.

15 22. The apparatus of Claim 21 further comprising at least one angle drive for rotating the article holder around an axis, wherein a minimum distance between the axis and the one or more first vortex chucks is smaller than a minimum distance between the axis and the one or more second vortex chucks.

20 23. The apparatus of Claim 21 further comprising at least one drive for moving the article while the article is held in the holder so that at least a portion of the article directly opposite to the one or more first vortex chucks moves faster than at least a portion of the article opposite to the one or more second vortex chucks.

24. An apparatus comprising an article holder comprising one or more first vortex chambers and one or more second vortex chambers, wherein during operation a gas emitted from the one or more first vortex chambers is colder than a gas emitted by the one or more second vortex chambers.

25 25. The apparatus of Claim 24 further comprising at least one angle drive for rotating the holder around an axis, wherein a minimum distance between the axis and the one or more first vortex chambers is smaller than a minimum distance between the axis and the one or more second vortex chambers.

26. The apparatus of Claim 24 further comprising at least one drive for moving an article while the article is held in the holder so that at least a portion of the article directly opposite to the one or more first vortex chambers moves faster than at least a portion of the article opposite to the one or more second vortex chambers.

FIG. 10A